

WHAT IS CLAIMED IS:

1. A scintillator assembly, comprising:
a scintillator material, having outer surfaces of a first shape; and
a preformed reflector, having inner surfaces which mate with said first shape to contain said scintillator material at least partly within said pre-formed reflector.
2. An assembly as in claim 1, wherein said inner surfaces of said pre-formed reflector press against outer surfaces of said scintillator material to hold said scintillator material within said preformed reflector.
3. An assembly as in claim 1, further comprising an adhesive material, bonding said scintillator material is bonded within said pre-formed reflector.
4. An assembly as in claim 2, further comprising ridges within said preformed reflector, holding said scintillator material within said preformed reflector.
5. An assembly as in claim 1, further comprising an opening in the preformed reflector, at a specified location,

corresponding to a specified location on the scintillator material.

6. An assembly as in claim 5, wherein said opening is at a location of an exit window within the scintillator material.

7. An assembly as in claim 5, wherein said opening is at a location of a light guide input to or output from the scintillator material.

8. An assembly as in claim 1, wherein said pre-formed reflector has inner surfaces for containing a plurality of separate units of scintillator material, forming a scintillator array.

9. An assembly as in claim 8, further comprising at least one air gap between a wall of the reflector and a surface of the scintillator material.

10. An assembly as in claim 9, further comprising a protrusion forming a spacer to form said air gap.

11. An assembly as in claim 1, further comprising a plurality of openings in the pre-formed reflector, at locations of a plurality of exit faces for the scintillator material.

12. An assembly as in claim 1, wherein the pre-formed reflector is formed of multiple pieces.

13. The scintillator assembly of claim 1, in which at least one pixel has at least one exit window smaller than the area of a face of the pixel upon which each said exit window is defined.

14. The scintillator assembly of claim 1, in which one or a plurality of scintillator pixels is shaped other than a rectangular parallelepiped.

15. The scintillator assembly of claim 1, in which the assembly comprises a plurality of pixels of scintillator material and reflector, positioned in an array.

16. The scintillator assembly of claim 1, in which the assembly comprises an array of a plurality of scintillator pixels of scintillator material and reflector, and in which at least one scintillator pixels comprises at least one

scintillator material differing from a scintillator material of an other scintillator pixels in said array.

17. The scintillator assembly of claim 1, in which at least one of the scintillator materials varies in cross-sectional area in at least one direction.

18. The scintillator assembly of claim 1, in which at least one of said scintillator materials has at least one exit face that is not perpendicular to adjacent sidewalls of the material.

19. The scintillator assembly of Claim 1, in which the reflector assembly is sufficiently flexible to permit insertion of scintillator material by press fitting.

20. The scintillator assembly of claim 1, further comprising at least one optical fiber inserted into said scintillator material.

21. The scintillator assembly of claim 20, in which said optical fiber is used for wavelength shifting.

22. The scintillator assembly of claim 9, further comprising at least one optical fiber inserted into or passing through one or a plurality of air gaps between one or a plurality of scintillator pixels and the corresponding pixels of the reflector assembly.

23. The scintillator assembly of claim 22, in which said at least one optical fiber is used for wavelength shifting.

24. The scintillator assembly of claim 1, further comprising at least one of inorganic or organic materials as an additive to the reflector material of a pre-formed reflector assembly.

25. The scintillator assembly of claim 24, in which titanium dioxide is an additive to the reflector material of a pre-formed reflector assembly or to the reflector material of one or a plurality of pre-formed reflector subassemblies.

26. The scintillator assembly of claim 24, in which one or a plurality of aluminum oxide, aluminum orthophosphate,

antimony trioxide, antimony tetroxide, barium oxide, barium carbonate, barium molybdate, bismuth oxybromide, bismuth oxychloride, bismuth oxyfluoride, calcium aluminate, calcium hydride, calcium peroxide, calcium trialuminate, calcium triorthophosphate, calcium tungstate, hafnium oxide, lanthanum oxide, magnesium carbonate, magnesium oxide, strontium peroxide, tin dichloride, zinc oxide, zirconium tetrachloride, and zirconium tetrafluoride is an additive to a material of the reflector.

27. The scintillator assembly of claim 24, in which one or a plurality of high-Z, high-density materials such as bismuth, bismuth oxychloride, bismuth oxyfluoride, gold, hafnium, hafnium oxide, iridium, lanthanum, lanthanum oxide, lead, lead oxide, osmium, platinum, platinum phosphide, rhenium, tantalum, tungsten, and other inorganic compounds of heavy metals is an additive to a material of the reflector.

28. The scintillator assembly of claim 24, in which at least one scintillating material such as barium fluoride, cerium-activated bismuth germanium oxide (BGO), cadmium tungstate, sodium-doped cesium iodide, thallium-doped cesium iodide, cerium fluoride, europium-doped calcium fluoride,

terbium-activated glass, europium-doped lithium, cerium-activated lithium glass, cerium-activated gadolinium silicate (GSO), lanthanum bromide, lanthanum chloride, thallium-doped sodium iodide, cerium-activated yttrium aluminum garnet (YAG), cerium-activated yttrium aluminum perovskite (YAP), cerium-activated lutetium orthoaluminate (LuAP), cerium-activated lutetium orthosilicate (LSO) and organic scintillators is an additive to the material of the reflector.

29. The scintillator assembly of claim 1, in which one or a plurality of organic optical brightening agents is an additive to the reflector.

30. The scintillator assembly of claim 1, in which at least one reflector assembly is formed of polyethylene filled with one or a plurality of additives.

31. The scintillator assembly of claim 30, further comprising titanium dioxide as an additive to polyethylene.

32. The scintillator assembly of claim 30, in which at least one of aluminum oxide, aluminum orthophosphate, antimony

trioxide, antimony tetroxide, barium oxide, barium carbonate, barium molybdate, bismuth oxybromide, bismuth oxychloride, bismuth oxyfluoride, calcium aluminate, calcium hydride, calcium peroxide, calcium trialuminate, calcium triorthophosphate, calcium tungstate, hafnium oxide, lanthanum oxide, magnesium carbonate, magnesium oxide, strontium peroxide, tin dichloride, zinc oxide, zirconium tetrachloride, and zirconium tetrafluoride is an additive to the reflector assembly of a pre-formed reflector assembly or to the reflector material of one or a plurality of pre-formed reflector subassemblies.

33. The scintillator assembly of claim 30, in which one or a plurality of high-Z, high-density materials such as bismuth, bismuth oxychloride, bismuth oxyfluoride, gold, hafnium, hafnium oxide, iridium, lanthanum, lanthanum oxide, lead, lead oxide, osmium, platinum, platinum phosphide, rhenium, tantalum, tungsten, and other inorganic compounds of heavy metals is an additive to the reflector assembly of a pre-formed reflector assembly or to the reflector material of one or a plurality of pre-formed reflector subassemblies.

34. The scintillator assembly of claim 30, in which one or a plurality of scintillating materials such as barium fluoride, cerium-activated bismuth germanium oxide (BGO), cadmium tungstate, sodium-doped cesium iodide, thallium-doped cesium iodide, cerium fluoride, europium-doped calcium fluoride, terbium-activated glass, europium-doped lithium, cerium-activated lithium glass, cerium-activated gadolinium silicate (GSO), lanthanum bromide, lanthanum chloride, thallium-doped sodium iodide, cerium-activated yttrium aluminum garnet (YAG), cerium-activated yttrium aluminum perovskite (YAP), cerium-activated lutetium orthoaluminate (LuAP), cerium-activated lutetium orthosilicate (LSO) and organic scintillators is an additive to the reflector assembly of a pre-formed reflector assembly or to the reflector material of one or a plurality of pre-formed reflector subassemblies.

35. The scintillator assembly of claim 30, in which one or a plurality of organic optical brightening agents is an additive to the reflector assembly of a pre-formed reflector assembly or to the reflector material of one or a plurality of pre-formed reflector subassemblies.

36. The scintillator assembly of claim 30, in which the pre-formed reflector assembly is formed by injection molding.

37. A method, comprising:
pre-forming a reflector of a specified shape having specified shaped inner surfaces; and
attaching said reflector to a scintillator material of a shape that fits within said inner surfaces.

38. A method as in claim 37, wherein said attaching comprises using pressure of an outer surface of said scintillator material against a pressure of an inner surface of said reflector to hold said scintillator material within said reflector.

39. A method as in claim 37, further comprising attaching said scintillator material to said reflector by an adhesive.

40. A method as in claim 37, wherein said preformed in comprises pre-forming a reflector having at least one opening therein.

41. A method as in claim 40, wherein said at least one opening mates with an exit window within the scintillator material.

42. A method as in claim 40, wherein said at least one opening includes a light guide input to or output from the scintillator material.

43. A method as in claim 37, wherein said reflector has a specified shape to hold a plurality of separate units of scintillator material.

44. A method as in claim 43, further comprising forming at least one air gap between adjacent scintillator material surfaces.